

**NORTH CAROLINA DIVISION OF  
AIR QUALITY**

## Application Review

**Issue Date:** xx/xx/2019

**Region:** Wilmington Regional Office  
**County:** Onslow  
**NC Facility ID:** 6700155  
**Inspector's Name:** Mark Hedrick  
**Date of Last Inspection:** 02/07/2019  
**Compliance Code:** 3 / Compliance - inspection

Facility Data	Permit Applicability (this application only)
<b>Applicant (Facility's Name):</b> Onslow County Landfill  <b>Facility Address:</b> Onslow County Landfill 415 Meadowview Road Jacksonville, NC 28540  <b>SIC:</b> 4953 / Refuse Systems <b>NAICS:</b> 562212 / Solid Waste Landfill  <b>Facility Classification: Before:</b> Title V <b>After:</b> Title V <b>Fee Classification: Before:</b> Title V <b>After:</b> Title V	<b>SIP:</b> 15A NCAC 02D .0524, 02D .1110, 02D .1806 <b>NSPS:</b> Subpart XXX <b>NESHAP:</b> 40 CFR 61, Subpart M <b>PSD:</b> N/A <b>PSD Avoidance:</b> N/A <b>NC Toxics:</b> Demonstration for benzene and vinyl chloride emissions <b>112(r):</b> N/A <b>Other:</b> N/A

Contact Data			Application Data
Facility Contact	Authorized Contact	Technical Contact	
Lisa Rider Deputy Director (910) 937-1442 415 Meadowview Road Jacksonville, NC 28540	Jack Bright Chairman of The Board (910) 557-7558 234 Northwest Corridor Boulevard Jacksonville, NC 28540	Lisa Rider Deputy Director (910) 937-1442 415 Meadowview Road Jacksonville, NC 28540	<b>Application Number:</b> 6700155.18A/6700155.18B <b>Date Received:</b> 06/15/2018 <b>Application Type:</b> Renewal/Modification <b>Application Schedule:</b> TV-Significant <b>Existing Permit Data</b> <b>Existing Permit Number:</b> 09928/T03 <b>Existing Permit Issue Date:</b> 04/09/2014 <b>Existing Permit Expiration Date:</b> 03/31/2019

Total Actual emissions in TONS/YEAR:							
CY	SO2	NOX	VOC	CO	PM10	Total HAP	Largest HAP
2017	0.9100	12.20	2.62	31.69	2.46	4.14	1.39 [Toluene]
2016	1.15	18.86	1.65	39.76	3.68	3.04	0.9637 [Toluene]
2015	1.25	17.37	1.54	44.46	3.50	2.92	0.8957 [Toluene]
2014	1.28	18.88	0.8000	44.96	3.76	1.97	0.6476 [Hydrogen chloride (hydrochlori)]
2013	1.11	4.82	1.10	54.97	1.55	1.57	0.5630 [Toluene]

<b>Review Engineer:</b> Joshua L. Harris  <b>Review Engineer's Signature:</b> _____ <b>Date:</b> _____	<b>Comments / Recommendations:</b> <b>Issue</b> 09928/T04 <b>Permit Issue Date:</b> xx/xx/2019 <b>Permit Expiration Date:</b> xx/xx/2024
--	---

## **1. Purpose of Application**

The Onslow County Landfill is an existing municipal solid waste (MSW) landfill, located in Jacksonville, Onslow County, NC. The facility has timely submitted permit application number 6700155.18B for a renewal of their current Title V air quality permit. Additionally, the facility is requesting that the permit be modified to include requirements for NSPS Subpart XXX. The modification application appears to have been originally submitted in February 2017, however the application was never received by DAQ, and was never processed. A copy of the modification application, number 6700155.18A, was provided with the renewal application, and will be consolidated with the renewal application under application number 6700155.18B. The application will go through the 30-day Public notice and 45-day EPA review periods prior to issuance.

The facility contact for this application is Lisa Rider, Deputy Director, (910-937-1442). A consulting firm, CDM Smith, Inc., was used for the application submittal. The contact at CDM Smith is Kenton Yang, Senior Environmental Engineer, (919-325-3500).

## **2. Facility Description**

The Onslow County Landfill is a MSW landfill currently consisting of two closed, unlined areas (ID No. ES-1 and ES-2), and one active Subtitle-D area (ID No. ES-3) and has a total design capacity of 4,869,373 Mg for all three sites. The facility was recently issued a permit-to-construct by the Department of Waste Management (DWM), Solid Waste Section (SWS) for the Phase 4 lateral expansion, triggering the modification provisions of NSPS Subpart XXX, and the landfill became subject to the subpart upon commencement of construction of Phase 4. The landfill currently has a voluntary gas collection and control system (GCCS) installed, and collected gas is routed to a flare or to a LFG-fired generator, both of which are owned and operated by Onslow Power Producers, LLC (Facility ID 6700162). The facility also has seven (7), 90 scfm solar flares (ID Nos. IES-CD16 through CD22) which are currently not installed but may be installed if needed.

In addition to the permitted sources and insignificant activities, the facility operates a number of small portable combustion sources including pumps and generators. As mobile sources, these engines are not subject to NSPS or MACT/GACT requirements.

## **3. Application Chronology**

- 06/15/18 The Wilmington Regional Office (WiRO) received the permit renewal application and forwarded a copy to the Raleigh Central Office (RCO).
- 06/21/18 RCO received a copy of the permit renewal application, application number 6700155.18B. The application referenced an application for a significant modification to include requirements of NSPS Subpart XXX due to a recent expansion, and appears to have been submitted in February 2017, but was never received by DAQ.
- 06/29/18 RCO sent letters to the facility acknowledging receipt of the permit applications.
- 06/29/18 Joshua Harris, RCO DAQ, sent an email to Kenton Yang, Senior Environmental Engineer, requesting copies of forms AA, D5 and E5 for the modification application, application number 67001553.18A, since these forms were submitted without signatures.

07/03/18 Joshua Harris received a phone call from Kenton Yang regarding the requested forms. Mr. Yang will have Mr. Bright, the Authorized Official sign the documents and will hand-deliver them to the WiRO. Mr. Yang followed-up with an email recapping the conversation.

07/12/18 Joshua Harris sent an email to Kenton Yang with questions about insignificant activities listed in the application, and about the flare and LFG-fired generator operated by another permitted facility, Onslow Power Producers, LLC (Facility ID 6700162). Additionally, Mr. Harris requested that the facility submit a toxics demonstration for toxic air pollutants which appear to exceed their respective TPERs.

07/20/18 Joshua Harris received an email from Kenton Yang stating that the engines used at the facility are portable and are used as needed in different locations around the site, and he provided the capacities of the tanks listed in the application. Mr. Yang also clarified the relationship with Onslow Power Producers, and ownership of equipment operated by the LFG-to-energy facility. Finally, Mr. Yang will submit a toxics demonstration for those pollutants which exceed their respective TPERs.

Mr. Yang also had questions regarding the requirements for a modeling protocol.

07/23/18 Joshua Harris responded to Kenton Yang's questions regarding dispersion modeling and the protocol, explaining the process as well as the option to submit a checklist in lieu of a protocol.

07/26/18 Joshua Harris spoke with Disha Shah and Kenton Yang, both of CDM Smith, regarding the request for toxics modeling. Discussed were sources which are required to have their emissions modeled, exemptions of sources (i.e. mobile sources, sources subject to MACT/NESHAP etc.), protocol/protocol checklist, and use of AERSCREEN. Mr. Harris followed-up with an email on AERSCREEN use vs. AERMOD, stating that AERSCREEN is acceptable.

08/31/18 Kenton Yang submitted a toxics demonstration via email to Joshua Harris. Mr. Harris forwarded the documents and files to Tom Anderson, AQAB Supervisor.

10/03/18 Joshua Harris and Matt Porter sent emails to Kenton Yang with questions regarding modeling parameters and emission rates.

11/02/18 Joshua Harris and Matt Porter spoke with with Kenton Yang, Christopher Campbell, and John Pehrson, all of CDM Smith, regarding the questions asked about the submitted modeling analysis. The modeling has been updated to address the questions and concerns that Mr. Porter had. The modeled emission rates have also been refined using separate LFG generation rates from LandGEM for each section, rather than treating the entire landfill as a single waste mass.

11/08/18 RCO issued a memo regarding the Tier 2 testing conducted in May 2018. NMOC emissions were calculated to be below 34 Mg/yr threshold, with the emission rate projected to reach 16.8 Mg/yr in 2022.

11/13/18 Kenton Yang resubmitted the modeling analysis via email, and also forwarded a hardcopy.

- 11/26/18 Matt Porter completed the review of the submitted modeling.
- 12/14/18 Joshua Harris sent Kenton Yang an email regarding asbestos disposal in the landfill.
- 12/28/18 Joshua Harris spoke with Kenton Yang and Lisa Rider, Deputy Director, regarding disposal of asbestos-containing waste at the landfill. Asbestos-containing wastes are accepted at the Subtitle D landfill, though rarely. Ms. Rider briefly described some of the practices, and it seems that the landfill is following the requirements of NESHAP Subpart M. A condition containing the requirements for active disposal sites for asbestos-containing wastes will be included in the permit.
- 01/14/19 Joshua Harris sent electronic copies of the draft permit and review documents to Booker Pullen, Samir Parekh, Dean Carroll, and Mark Hedrick for comments
- 01/18/19 Responses were received from Booker Pullen, who had minor editorial comments, and Samir Parekh, who had no comments
- 01/29/19 The Wilmington Regional Office did not respond with comments.
- 01/30/19 Joshua Harris sent electronic copies of the draft permit and review documents to Jack Bright, Lisa Rider, and Kenton Yang for comments.
- 02/07/19 Mark Hedrick conducted a compliance inspection and found the landfill to be operating in apparent compliance.
- 02/12/19 Joshua Harris received an email from Kenton Yang with the facility's comments on the draft permit and review documents. Most were minor comments, however the facility did question the reporting requirement in the NSPS XXX condition, specifically section 2.1 A.1.e.ii. which stated that subsequent NMOC emission rate reports submitted after the initial report shall be submitted annually on or before January 30 of each year.
- Mr. Yang pointed out that the facility submits the report each year in July. The NSPS does not specify a particular deadline for the report, only that it must be submitted "annually," so the specified date for the report was removed.
- 02/14/19 Joshua Harris responded to Kenton Yang's email and provided revised drafts. Lisa Rider responded by phone stating that the landfill had no additional comments on the revised documents.
- Xx/xx/19 30-day public notice and 45-day EPA review periods begin
- Xx/xx/19 Public notice period ends; [comments received]
- Xx/xx/19 EPA review period ends; [comments received]
- Xx/xx/19 Air Quality Permit No. 09928T04 issued.

#### 4. Table of Changes to Existing Permit No. 09928T03

Page No.	Section	Description of Changes
Cover and throughout	Cover and throughout	<ul style="list-style-type: none"> <li>• New letterhead.</li> <li>• Changed revision number throughout.</li> <li>• Changed effective and expiration dates.</li> </ul>
Attachment to cover	Attachment to cover	<ul style="list-style-type: none"> <li>• Added insignificant sources IES-1, IES-2, and IES-3 as listed.</li> <li>• Removed IES-ACB which is no longer installed on site.</li> <li>• Updated URL for MACT/GACT information.</li> </ul>
3	1. (table)	<ul style="list-style-type: none"> <li>• Removed citations for NSPS Subpart WWW, and replaced with citations for NSPS Subpart XXX.</li> <li>• Inserted citation for 40 CR 61, Subpart M.</li> </ul>
3	2.1 A. (table)	<ul style="list-style-type: none"> <li>• Changed NMOC standard to 34 Mg/yr.</li> <li>• Removed citation for NSPS Subpart WWW and replaced with citation for NSPS Subpart XXX.</li> <li>• Inserted row for asbestos and included applicable standards and regulatory citations for 15A NCAC 02D .1110 and 40 CFR 61, Subpart M.</li> </ul>
3-6	2.1 A.1.	<ul style="list-style-type: none"> <li>• Removed permit conditions for NSPS Subpart WWW.</li> <li>• Inserted permit conditions for NSPS Subpart XXX.</li> </ul>
7-8	2.1 A.2.	Inserted permit conditions for 15A NCAC 02D .1110 “National Emission Standards for Hazardous Air Pollutants” including applicable requirements from 40 CFR 61, Subpart M.
9-18	3.	Updated General Conditions to most recent version (version 5.3 08/21/2018).

## 5. Changes in Equipment

- Removed temporary air curtain burner (ID No. IES-ACB) as an insignificant source.
- Added two 365,000-gallon above ground leachate storage tanks as ID No. IES-1.
- Added one 15,000-gallon above ground leachate clarifier tank as ID No. IES-2.
- Added one 1,000-gallon above ground diesel storage tank as ID No. IES-3.

Title V equipment editor is up-to-date for the changes listed.

The facility's permitted emission sources are as follows:

Emission Source ID No.	Emission Source Description	Control Device ID No.	Control Device Description
ES-1 <b>NSPS XXX</b> <b>40 CFR 61, Subpart M</b>	Municipal solid waste landfill: Unlined Category 1 northern portion (closed)	GCCS-1*	Landfill gas collection and control system with:
ES-2 <b>NSPS XXX</b> <b>40 CFR 61, Subpart M</b>	Municipal solid waste landfill: Unlined Category 1 southern portion (closed)	CD-1**	Candle stick type flare (800 scfm)
ES-3 <b>NSPS XXX</b> <b>40 CFR 61, Subpart M</b>	Municipal solid waste landfill: Subtitle D portion (active)		

\* The GCCS has been installed voluntarily and is not subject to the requirements of NSPS Subpart XXX.

\*\* The flare is owned and operated by Onslow Power Producers (LFG-to-energy facility, Permit No. 10253).  
The Onslow County Landfill does not exercise any control over the operation of the LFG-to-energy facility.

The facility's insignificant/exempt activities are as follows:

Emission Source ID No.	Emission Source Description
IES-1	Two above ground, open-top leachate storage tanks (365,000-gallon capacity each)
IES-2	One above ground leachate clarifier tank (15,000-gallon capacity)
IES-3	One above ground diesel storage tank (1,000-gallon capacity)
IES-CD16	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD17	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD18	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD19	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD20	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD21	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3
IES-CD22	One solar flare (maximum 90 scfm lfg) located in landfill Section ES-3

## 6. NSPS, NESHAP, PSD, 112(r), CAM & Attainment Status

- **NSPS** –
  - ✓ The MSW landfills (ID Nos. ES-1, ES-2, and ES-3) are subject to 40 CFR 60, Subpart XXX, “Municipal Solid Waste Landfills that Commenced Construction, Reconstruction, or Modification After July 17, 2014.” The facility recently constructed the Phase 4 lateral expansion, which was permitted for construction in September 2015. The most recent Tier 2 sampling indicates that the NMOC emission rate projected through 2022 will be below 34 Mg/yr, so the landfill is not yet subject to the requirements to install and operate a GCCS. A voluntary GCCS is currently being operated in portions of the landfill.
  - ✓ The MSW landfills (ID Nos. ES-1, ES-2, and ES-3) are NOT subject to 40 CFR 60, Subpart WWW, “Municipal Solid Waste Landfills,” since it is superseded by NSPS subpart XXX.
- **NESHAP** –
  - ✓ The MSW landfills (ID Nos. ES-1, ES-2, and ES-3) are NOT subject to 40 CFR 63, Subpart AAAA, “Municipal Solid Waste Landfills,” since the uncontrolled NMOC emission rate is below 50 Mg/yr.
  - ✓ The facility is subject to 40 CFR 61, Subpart M, “National Emission Standard for Asbestos,” since asbestos-containing waste is actively accepted.
- **PSD** – The facility’s potential emissions do not exceed PSD permitting thresholds.
  - ✓ Onslow County has not triggered increment tracking under PSD.
- **112(r)** – The facility does not store any of the listed 112(r) chemicals in amounts that exceed the threshold quantities, therefore, it is not required to maintain a written Risk Management Plan (RMP).
- **CAM** – CAM does not apply to this facility.
- **Attainment status** – Onslow County is in attainment for all criteria pollutants.

## 7. Regulatory Review

The existing 15A NCAC 02D .0524 permit condition for NSPS Subpart WWW will be removed as it is no longer applicable.

The facility is subject to the following air quality regulations in addition to the General Conditions:

- 15A NCAC 02D .0524: New Source Performance Standards, 40 CFR 60, Subpart XXX
- 15A NCAC 02D .1110: National Emission Standards for Hazardous Air Pollutants, 40 CFR 61, Subpart M
- 15A NCAC 02D .1806: Control and Prohibition of Odorous Emissions

**15A NCAC 02D .0524: New Source Performance Standards, 40 CFR 60, Subpart XXX**

As previously stated, the MSW landfills (ID Nos. ES-1, ES-2, and ES-3) recently became subject to 40 CFR 60, Subpart XXX. NMOC emissions were calculated using the Tier 2 methodology and are below the 34 Mg/yr threshold which would require installation and operation of a GCCS. The facility does have a voluntary GCCS installed, which collects gas that is then routed to a separate facility, Onslow Power Producers, LLC (Facility ID 6700162). Onslow Power Producers owns and operates an open flare and a LFG-fired generator under air quality Permit No. 10253R04.

A permit condition for NSPS Subpart XXX will be included in this permit revision. The facility is required to continue making demonstrations for the annual NMOC emission rate, keep appropriate records, and submit periodic reports. Upon exceeding the 34 Mg/yr threshold for NMOC emissions, the landfill will trigger the requirements to submit a GCCS design plan for approval, and subsequently install and operate the GCCS. Continued compliance is expected.

**15A NCAC 02D .1110: National Emission Standards for Hazardous Air Pollutants, 40 CFR 61, Subpart M**

The facility is an active disposal site for asbestos-containing wastes, therefore it is subject to the requirements of this regulation. To comply, the facility must adhere to a general set of work practices which may include ensuring there are no visible emissions at the disposal site, covering waste daily with at least six inches of compacted non-asbestos material or use another dust suppression agent, or the landfill may propose alternative methods for DAQ approval. The facility will be required to post signage and barriers if the method of compliance does not include covering the asbestos-containing waste. Closed portions of the landfill which have previously received asbestos-containing waste are also subject and are required to comply with the requirements of 40 CFR 61.151 for inactive waste disposal sites. The facility's current Solid Waste permit contains a requirement for the facility to comply with the requirements of 40 CFR 61, Subpart M, and continued compliance is expected.

**15A NCAC 02D .1806: Control and Prohibition of Odorous Emissions**

This is a State-Only requirement and is applicable facility-wide. The facility shall not cause or contribute to objectionable odors beyond the property boundary. DAQ inspectors have not noted any objectionable odors during inspections. No complaints of objectionable odors have been received by the facility or by DAQ. Continued compliance is expected.

**8. Other Regulatory Requirements**

- A Zoning Consistency Determination is NOT required for these permit applications.
- The applications were sealed by Kenton Yang, who is a registered Professional Engineer in the State of North Carolina (Seal #029928).
- No permit application fees are required for renewal or for the modification since the modification is due to a change in regulations.



## 9. Air Toxics

The facility has never triggered a toxics demonstration in the past. Previously, 15A NCAC 02Q .0705 allowed sources subject to a MACT standard to delay making a toxics demonstration until submittal of the permit application to comply with the last MACT known to apply to the source, and since the facility may be subject to 40 CFR 63, Subpart AAAA in the future, a toxics demonstration was never required. In June 2012, General Statute 143-215.107(a)(5) was amended by Session Law 2012-91, House Bill 952. Section 3 of the Session Law required DAQ to review the existing air toxics rules, and 15A NCAC 02Q .0705 was repealed, effective May 1, 2014, as a result of that review process. Since the Phase 4 expansion results in a net increase in emissions of toxic air pollutants, toxic emissions are being evaluated.

Initially, the facility submitted calculations treating all portions of the landfill as a single unit for the purposes of calculating the LFG generation rate. The facility later refined the analysis and ran separate LandGEM models for each individual landfill. The LFG generation rate from each section of the landfill was calculated using the following inputs:

LandGEM Input	ES-1	ES-2	ES-3
Landfill Open Year	1985	1988	1998
Landfill Closure Year	1988	1996	2047
Design Capacity (Mg) (Waste-in-place if closed)	192,709	631,699	6,210,645
Waste Acceptance Rate (TPY)	Closed	Closed	Historical, plus an assumed future increase of ~1.5% annually
Methane Generation Rate (year <sup>-1</sup> )	0.05	0.05	0.05
Potential Methane Generation Capacity (m <sup>3</sup> /Mg)	170	170	170
NMOC Concentration (ppmv)	84	84	84
Methane Content	50%	50%	50%
LFG Generation Rate at Peak (m <sup>3</sup> /yr)	163,157	724,083	42,798,506

The landfill submitted a projection of the actual landfill volume emissions at the peak emission rate in CY2047 using the pollutant concentrations and methodologies in AP-42 Chapter 2.4 (November 1998). To determine the collection efficiencies for each portion of the landfill, the facility used the methods in 40 CFR 98 Subpart HH, “Mandatory Greenhouse Gas Reporting: Municipal Solid Waste Landfills,” Table HH-3 – Landfill Gas Collection Efficiencies. The solar flares were evaluated separately, and the emission rates were based on the total maximum flow rate.

The following example calculation is for the emission of hydrochloric acid (HCl) created from the combustion of the chlorine compounds in the solar flares. The best methods to estimate emissions are mass balance methods using site specific data on total chloride [expressed in ppmv as the chloride ion (Cl<sup>-</sup>)]. [AP-42, Section 2.4.4.2 – Controlled Emissions]

- Total solar flare design rating = 630 ft<sup>3</sup>/minute (or 17.84 m<sup>3</sup>/min = 1,070.4 m<sup>3</sup>/hour)
- Methane is only 50% of this gas stream (535.2 m<sup>3</sup>/hour)
- Q<sub>Cl<sup>-</sup></sub> = Emission rate of chloride ions, m<sup>3</sup>/hour
- C<sub>Cl<sup>-</sup></sub> = Concentration of chloride ions (42.0 ppmv, AP-42 default value)
- Multiplication factor for 50% methane concentration in landfill gas = 2.0
- Molecular weight of chloride ions = 35.45 g/gmole

$$Q_{Cl^-} = 2.0 \times Q_{CH_4} \times \left( \frac{C_{Cl^-}}{1 \times 10^6} \right) \text{ (AP-42, Equation 3)}$$

$$Q_{Cl^-} = 2.0 \times 535.2 \frac{m^3}{hour} \times \left( \frac{42.0 \text{ parts}}{1 \times 10^6} \right) = 0.045 \frac{m^3}{hour}$$

The mass of the pre-combustion chloride ions present in the methane were found using Equation 4 of AP-42, Section 2.4.4.2.

$$UM_{Cl^-} = 0.045 \frac{m^3}{hour} \times \left[ \frac{35.45 \text{ g/gmol} \times 1 \text{ atm}}{8.205 \times 10^{-5} \frac{m^3 \cdot atm}{gmol \cdot K} \times 1000 \frac{g}{kg} \times (273 + 25^\circ C) K} \right] \times 2.2 \frac{lb}{kg}$$

$$UM_{Cl^-} = 0.143 \frac{lb Cl^-}{hour}$$

To calculate the HCl from the chloride ions, Equation 10 of Section 2.4-8 was used.

$$HCl_{\text{emissions}} = UM_{Cl^-} \times \frac{\eta_{col}}{100} \times 1.03 \times \frac{\eta_{cnt}}{100}$$

Where:

UM<sub>Cl</sub> = Uncontrolled mass emission of Cl<sup>-</sup> ions

η<sub>col</sub> = Collection efficiency of the landfill gas collection system, percent (100%)\*

η<sub>cnt</sub> = Control efficiency of the landfill gas control flare (100%)\*

\* The default collection efficiency listed in AP-42 is 75%, and the default destruction efficiencies for flares are 98% and 99.7% respectively for halogenated and non-halogenated compounds. To calculate worst-case HCl emissions, the facility assumes that 100% of the generated Cl<sup>-</sup> ions are collected and converted to HCl rather than using the default collection and control efficiencies.

$$HCl_{\text{emissions}} = 0.143 \frac{lb Cl^-}{hour} \times \frac{100}{100} \times 1.03 \times \frac{100}{100} = 0.148 \frac{lb HCl}{hour}$$

The total emissions of other toxic air pollutants from the landfill and flare were calculated using AP-42 Section 2.4-6 Equation 5. The first term accounts for emissions from uncollected landfill gas, and the second term accounts for emissions of the pollutant which were collected but pass through the flare without being incinerated:

$$CM_p = \left[ UM_p \times \left( 1 - \frac{\eta_{col}}{100} \right) \right] + \left[ UM_p \times \frac{\eta_{col}}{100} \times \left( 1 - \frac{\eta_{cnt}}{100} \right) \right]$$

Where:

$CM_p$  = Controlled mass emissions of pollutant

$UM_p$  = Uncontrolled mass emission of pollutant (as determined using Equations 3 and 4)

$\eta_{col}$  = Collection efficiency of the landfill gas collection system, percent  
(Facility uses methodology in 40 CFR 98, Subpart HH to determine collection efficiency)

$\eta_{cnt}$  = Control efficiency of the landfill gas control flare  
(98% for halogenated compounds, 99.7% for non-halogenated compounds per AP-42)

The equation can be expressed as a summation of emission rates for each landfill section where each term is annotated respectively as 1, 2, and 3 to represent emissions of the pollutant from ES-1, ES-2, and ES-3:

$$CM_p = \left[ UM_p \times \left( 1 - \frac{\eta_{col}}{100} \right) \right]_1 + \left[ UM_p \times \left( 1 - \frac{\eta_{col}}{100} \right) \right]_2 + \left[ UM_p \times \left( 1 - \frac{\eta_{col}}{100} \right) \right]_3 \\ + \left[ UM_p \times \frac{\eta_{col}}{100} \times \left( 1 - \frac{\eta_{cnt}}{100} \right) \right]$$

Example calculation for toxic air pollutant benzene (lb/yr):

The following inputs were used in Equation 5:

Variable Input	ES-1	ES-2	ES-3	Solar Flares*
$UM_{Benzene}$ (lb/yr)	2.19	9.72	574.51	125.87
Collection Efficiency	0%	82%	92%	100%
Control Efficiency	-----	-----	-----	99.7%

\* Solar flare emissions were calculated assuming the maximum flow rate regardless of collection efficiency of the controlled area.

$$CM_{Benzene} = \left[ 2.19 \frac{lb}{yr} \times \left( 1 - \frac{0}{100} \right) \right]_1 + \left[ 9.72 \frac{lb}{yr} \times \left( 1 - \frac{82}{100} \right) \right]_2 + \left[ 574.51 \frac{lb}{yr} \times \left( 1 - \frac{92}{100} \right) \right]_3 \\ + \left[ 125.87 \frac{lb}{yr} \times \frac{100}{100} \times \left( 1 - \frac{99.7}{100} \right) \right]$$

$$CM_{Benzene} = 50.28 \frac{lb \text{ Benzene}}{yr}$$

Total volume emissions of toxic air pollutants from the landfill, and emissions from the solar flares were compared to their respective TPERs from 15A NCAC 02Q .0711:

Toxic Air Pollutant	Averaging Period	Total Landfill Emissions	Flare Emissions	Total	TPER	Modeling Required?
1,1,1-Trichloroethane (methyl chloroform)	lb/day	0.059	$2.96 \times 10^{-3}$	0.062	250	No
	lb/hr	$2.45 \times 10^{-3}$	$1.23 \times 10^{-4}$	$2.57 \times 10^{-3}$	64	No
1,1,2,2-Tetrachloroethane	lb/yr	62.32	3.14	65.46	430	No
1,1-Dichloroethene (vinylidene chloride)	lb/day	0.018	$8.96 \times 10^{-4}$	0.019	2.5	No
1,2-Dibromoethane (ethylene dibromide)	lb/yr	0.63	$3.17 \times 10^{-3}$	0.63	27	No
1,2-Dichloroethane (ethylene dichloride)	lb/yr	13.57	0.68	14.25	260	No
2-Butanone (MEK)	lb/day	0.47	$3.55 \times 10^{-3}$	0.47	78	No
	lb/hr	0.020	$1.48 \times 10^{-4}$	0.020	22.4	No
4-Methyl-2-pentanone (MIBK)	lb/day	0.17	$1.30 \times 10^{-3}$	0.17	52	No
	lb/hr	$7.15 \times 10^{-3}$	$5.41 \times 10^{-5}$	$7.20 \times 10^{-3}$	7.6	No
Acrylonitrile	lb/day	0.31	$2.33 \times 10^{-3}$	0.31	0.4	No
	lb/hr	0.013	$9.70 \times 10^{-5}$	0.013	0.22	No
Benzene	lb/yr	49.90	0.38	50.28	8.1	<b>YES</b>
Carbon disulfide	lb/day	$4.05 \times 10^{-2}$	$3.06 \times 10^{-4}$	0.041	3.9	No
Carbon tetrachloride	lb/yr	0.21	0.010	0.22	460	No
Chlorobenzene	lb/day	0.026	$1.30 \times 10^{-3}$	0.027	46	No
Chloroform	lb/yr	1.20	0.060	1.26	290	No
p-Dichlorobenzene	lb/hr	$1.13 \times 10^{-3}$	$5.95 \times 10^{-5}$	$1.19 \times 10^{-3}$	16.8	No
Dichloromethane (methylene chloride)	lb/yr	406.27	20.49	426.76	1600	No
	lb/hr	0.046	$2.34 \times 10^{-3}$	0.048	0.39	No
Ethyl mercaptan	lb/hr	$5.41 \times 10^{-3}$	$4.09 \times 10^{-5}$	$5.45 \times 10^{-3}$	0.025	No
n-Hexane	lb/day	0.52	$3.93 \times 10^{-3}$	0.52	23	No
Hydrogen chloride	lb/hr	-----	0.15	0.15	0.18	No
Hydrogen sulfide	lb/day	1.11	$8.39 \times 10^{-3}$	1.12	1.7	No
Mercury (alkyl)	lb/day	$5.37 \times 10^{-5}$	$4.06 \times 10^{-7}$	$5.41 \times 10^{-5}$	0.0013	No
Mercury vapor	lb/day	-----	$1.35 \times 10^{-4}$	$1.35 \times 10^{-4}$	0.013	No
Methanethiol (methyl mercaptan)	lb/hr	$4.57 \times 10^{-3}$	$3.46 \times 10^{-5}$	$4.60 \times 10^{-3}$	0.013	No
Tetrachloroethylene (Perchloroethylene)	lb/yr	206.89	10.44	217.33	13000	No
Toluene	lb/day	3.32	0.025	3.35	98	No
	lb/hr	0.14	$1.05 \times 10^{-3}$	0.14	14.4	No
Trichloroethylene	lb/yr	123.94	6.25	130.19	4000	No
Vinyl chloride	lb/yr	153.44	7.74	161.18	26	<b>YES</b>
Xylene	lb/day	1.17	$8.91 \times 10^{-3}$	1.18	57	No
	lb/hr	0.049	$3.71 \times 10^{-4}$	0.049	16.4	No

The TPERs were exceeded for benzene and vinyl chloride. The facility submitted a modeling analysis for projected emissions through the end of life of the landfill in CY2047, and the modeling analysis was reviewed by Matt Porter of AQAB. The model was run assuming final buildout conditions of the landfill, including operation of the solar flares. The following impacts resulted at the property boundary:

Pollutant	Source		Emission Rate (lb/hr)	Concentration at Property Boundary ( $\mu\text{g}/\text{m}^3$ )	AAL ( $\mu\text{g}/\text{m}^3$ )	% AAL
Benzene	Landfills	ES-1	$2.52 \times 10^{-4}$	0.02	0.12	16.7%
		ES-2	$1.97 \times 10^{-4}$			
		ES-3	$5.29 \times 10^{-3}$			
	Flares	Each	$6.28 \times 10^{-6}$			
Vinyl chloride	Landfills	ES-1	$7.77 \times 10^{-4}$	0.05	0.38	13.2%
		ES-2	$6.05 \times 10^{-4}$			
		ES-3	$1.63 \times 10^{-2}$			
	Flares	Each	$1.29 \times 10^{-4}$			

None of the emitted toxic air pollutants exceed their respective TPERs and the AAL, therefore DAQ has determined that there is not an unacceptable risk to human health. In accordance with 15A NCAC 02Q.0702(27)(A), the permit will not contain conditions for 15A NCAC 02Q .0711 nor 02D .1100 since the landfill is subject to 40 CFR 61, Subpart M.

## 10. Emissions Review

Potential emissions before controls at peak in CY2047:

Pollutant	Landfill Volume Emissions (tons/yr)
NMOC	23.54
VOC	9.18
Individual HAP (Toluene)	7.18
Total HAP	20.81

Potential emissions after controls at peak in CY2047:

Pollutant	Landfill Volume Emissions (tons/yr)	Solar Flares (tons/yr)	Total (tons/yr)
NMOC	2.00	0.02	2.02
PM (TSP)	--	1.41	1.41
PM <sub>10</sub>	--	1.41	1.41
PM <sub>2.5</sub>	--	1.41	1.41
SO <sub>2</sub>	--	1.27	1.27
NO <sub>x</sub>	--	3.31	3.31
CO	--	13.91	13.91
VOC	0.78	0.01	0.79
Individual HAP (Toluene)	0.61	$4.56 \times 10^{-3}$	0.61
Total HAP	1.77	0.74	2.51

Actual emissions for the landfill as reported on the annual emission inventories can be viewed in the table on page 1 of this document.

### MSW Landfills:

The landfill volume emissions were calculated using the peak LFG generation rate from the LandGEM output, and the pollutant concentrations and methodology from AP-42 Chapter 2.4 (November 1998). The NMOC emissions were calculated using an NMOC concentration of 139 ppmv, based on the most recent Tier 2 sample, and VOC emissions are assumed to be 39% of the NMOC emissions per AP-42 (November 1998). Post collection and control potential emissions were calculated by applying collection efficiencies for each section of the landfill, similar to what is shown in Section 9 above.

Solar Flares:

NMOC, VOC, and HAP emission rates for the flares are based on the total maximum capacity, regardless of LFG generation rate from the landfill, and control efficiencies of 98% and 99.7% for halogenated and non-halogenated compounds, respectively.

Particulate, NOx, and CO emissions were calculated using the following emission factors:

CO: 168 lb/10<sup>6</sup> ft<sup>3</sup> CH<sub>4</sub> (Vendor guarantee)

NOx: 40 lb/10<sup>6</sup> ft<sup>3</sup> CH<sub>4</sub> (AP-42 2.4-5)

PM: 17 lb/10<sup>6</sup> ft<sup>3</sup> CH<sub>4</sub> (AP-42 2.4-5)

The solar flares are rated for a total flow rate of 630 scfm or 315 ft<sup>3</sup> CH<sub>4</sub> per minute (165.6 million ft<sup>3</sup> CH<sub>4</sub> per year), assuming the landfill gas consists of 50% methane.

Examples:

$$\frac{165.6 \text{ million ft}^3 \text{ CH}_4}{\text{year}} \times \frac{168 \text{ lb CO}}{\text{million ft}^3 \text{ CH}_4} \times \frac{1 \text{ ton}}{2000 \text{ lb}} = 13.91 \frac{\text{tons CO}}{\text{year}}$$

$$\frac{165.6 \text{ million ft}^3 \text{ CH}_4}{\text{year}} \times \frac{40 \text{ lb NOx}}{\text{million ft}^3 \text{ CH}_4} \times \frac{1 \text{ ton}}{2000 \text{ lb}} = 3.31 \frac{\text{tons NOx}}{\text{year}}$$

$$\frac{165.6 \text{ million ft}^3 \text{ CH}_4}{\text{year}} \times \frac{17 \text{ lb PM}}{\text{million ft}^3 \text{ CH}_4} \times \frac{1 \text{ ton}}{2000 \text{ lb}} = 1.41 \frac{\text{tons PM}}{\text{year}}$$

All particulate emissions from the combustion of landfill gas are considered as PM<sub>2.5</sub>.

To calculate potential SO<sub>2</sub> emissions, AP-42 Chapter 2.4 was used along with information submitted by the facility in the application:

- Total solar flare design rating = 630 ft<sup>3</sup>/minute (or 17.84 m<sup>3</sup>/min = 1,070.4 m<sup>3</sup>/hour)
- Methane is only 50% of this gas stream (535.2 m<sup>3</sup>/hour)
- Q<sub>S</sub> = Emission rate of reduced sulfur compounds, m<sup>3</sup>/hour
- C<sub>S</sub> = Concentration of reduced sulfur compounds (46.9 ppmv, AP-42 default)
- Multiplication factor for 50% methane concentration in landfill gas = 2.0
- Molecular weight of sulfur = 32.06 g/mole

$$Q_S = 2.0 \times Q_{\text{CH}_4} \times \left( \frac{C_S}{1 \times 10^6} \right) \text{ (AP-42, Equation 3)}$$

$$Q_S = 2.0 \times 535.2 \frac{\text{m}^3}{\text{hour}} \times \left( \frac{46.9 \text{ parts}}{1 \times 10^6} \right) = 0.0502 \frac{\text{m}^3}{\text{hour}}$$

The mass of the pre-combustion sulfur compounds present in the methane were found using Equation 4 of AP-42, Section 2.4.4.2.:

$$UM_S = 0.0502 \frac{\text{m}^3}{\text{hour}} \times \left[ \frac{32.06 \text{ g/gmol} \times 1 \text{ atm}}{8.205 \times 10^{-5} \frac{\text{m}^3 \cdot \text{atm}}{\text{gmol} \cdot \text{K}} \times 1000 \frac{\text{g}}{\text{kg}} \times (273 + 25^\circ\text{C}) \text{ K}} \right] \times 2.2 \frac{\text{lb}}{\text{kg}}$$

$$UM_S = 0.145 \frac{\text{lb S}}{\text{hour}}$$

To calculate SO<sub>2</sub> emitted from the combustion of sulfur compounds in the flare, Equation 10 of Section 2.4-8 was used.

$$\text{SO}_2 \text{ emitted} = \text{UM}_s \times \frac{\eta_{\text{col}}}{100} \times 2.0$$

Where:

UM<sub>cl</sub> = Uncontrolled mass emission rate of sulfur compounds (0.145 lb sulfur/hour)

η<sub>col</sub> = Collection efficiency of the landfill gas collection system, percent\*

2.0 = Ratio of the molecular weight of SO<sub>2</sub> to the molecular weight of Sulfur

\* To calculate worst-case SO<sub>2</sub> emissions, assume that 100% of the generated sulfur compounds are collected and converted to SO<sub>2</sub>.

$$\text{SO}_2 \text{ emitted} = 0.145 \frac{\text{lb S}}{\text{hour}} \times \frac{100}{100} \times 2.0 \times 8760 \frac{\text{hours}}{\text{year}} \times \frac{1 \text{ ton}}{2000 \text{ lb}}$$

$$\text{SO}_2 \text{ emitted} = 1.27 \frac{\text{tons SO}_2}{\text{year}}$$

## 11. Source Testing Information

The facility conducted Tier 2 sampling on May 23-24, 2018 to demonstrate that NMOC emission are below the threshold for which a GCCS would be required to be installed and operated. The sample resulted in a site-specific NMOC concentration of 139 ppmv. The latest results are as follows:

Emissions Year Modeled	Estimated Annual Waste Acceptance Rate (Mg/Yr)	As of January 1, Current Solid Waste-in-place (Mg)	Modeled Tier 2 NMOC Emissions (Mg/Yr)
2017	107,623	3,013,152	13.9
2018	167,969	3,120,775	14.2
2019	167,969	3,288,744	14.9
2020	167,969	3,456,713	15.5
2021	167,969	3,624,682	16.2
2022	167,969	3,792,650	16.8

## 12. Statement of Compliance

The Onslow County Landfill has no negative compliance history. Mark Hedrick, WiRO DAQ, conducted the latest compliance inspection on February 7, 2019, and found the facility to be operating in apparent compliance.



### **13. Public Notice Review**

A notice of the DRAFT Title V Permit shall be made pursuant to 15A NCAC 02Q .0521. The notice will provide for a 30-day comment period, with an opportunity for a public hearing. Consistent with 15A NCAC 02Q .0525, the EPA will have a concurrent 45-day review period. Copies of the public notice shall be sent to persons on the Title V mailing list and EPA. Pursuant to 15A NCAC 02Q .0522, a copy of each permit application, each proposed permit and each final permit pursuant shall be provided to EPA.

The 30-day public notice period was from MONTH XX, 2019 through MONTH XX, 2019.

The EPA 45-day review period was from MONTH XX, 2019 through MONTH XX, 2019.

[Number of] comments were received during the public notice period and EPA 45-day review.

### **14. Comments and Recommendations**

The permit renewal and modification applications for the Onslow County Landfill located in Jacksonville, Onslow County, NC have been reviewed by DAQ to determine compliance with all procedures and requirements. DAQ has determined that this facility is complying or will achieve compliance, as specified in the permit, with all requirements that are applicable to the affected sources. The DAQ recommends the issuance of Air Permit No. 09928T04.